26. Minimum Design Criteria

The Minimum Design Criteria (MDC) are new, updated design standards for stormwater control measures (SCMs). The MDC in the chapter reflect the wording in the proposed stormwater rules adopted by the Environmental Management Commission on July 14, 2017. These rules are currently under review by the Rules Review Commission. The earliest possible effective date of the rules is January 1, 2017. However, the effective date will be later than this depending on the findings of the Rules Review Commission and the possibility of the rules needing legislative review.

As the rules receive these final reviews, designs for SCMs that are submitted as part of a state-issued permit application shall be considered to provide equal or better protection of surface waters of the state if the design meets all of the General MDC for all SCMs as well as all of the device-specific MDC. Applicants who choose to follow the MDC rather than the other chapters of this manual shall provide a complete permit application form with all of the required items, including plans and calculations that show compliance with the MDC. If the MDC are updated during the permitting process, the applicant will follow the version of the MDC that was in place on the date the application was received by the state. Because using the MDC is currently considered to be an alternative design, projects that follow the MDC are not eligible for the express permitting program.

Local governments have the choice about whether to allow the MDC within their jurisdictions. Designers seeking a stormwater permit from a local government should check to see if SCMs designed per the MDC will be accepted before applying.

For more information about the rule-making process, please visit: http://portal.ncdenr.org/web/lr/rule-readoption. If you have questions about the MDC, please contact Annette Lucas at (919) 807-6381 or annette.lucas@ncdenr.gov.

Image credit: NCSU-BAE

MDC FOR ALL STORMWATER CONTROL MEASURES

These Minimum Design Criteria (MDC) are required for every SCM. SCMs are also required to adhere to the MDC associated with the specific type of SCM being implemented.

(1) SIZING. The design volume of SCMs shall take into account the runoff at build out from all surfaces draining to the system. Drainage from off-site areas may be bypassed. The combined design volume of all SCMs on the project shall be sufficient to handle the required storm depth.

(2) CONTAMINATED SOILS. SCMs that allow stormwater to infiltrate shall not be located on or in areas with contaminated soils.

(3) SIDE SLOPES. Side slopes of SCMs stabilized with vegetated cover shall be no steeper than 3:1 (horizontal to vertical). Retaining walls, gabion walls, and other engineered surfaces may be steeper than 3:1. Steeper vegetated slopes may be considered on a case-by-case basis if the applicant demonstrates that the soils and vegetation shall remain stable.

(4) EROSION PROTECTION. The inlets and outlets of SCMs shall be designed to protect the SCM from erosion resulting from stormwater discharges. The outlets of SCMs shall be designed so that they do not cause erosion immediately downslope of the discharge point during the peak flow from the 10-year storm event as shown by engineering calculations.

(5) EXCESS FLOWS. SCMs shall include an overflow or bypass device for inflow volumes in excess of the treatment volume, or, if applicable, the peak attenuation volume.

(6) DEWATERING. SCMs shall have a method to draw down any standing water to facilitate maintenance and inspection.

(7) CLEAN OUT AFTER CONSTRUCTION. Every SCM impacted by sedimentation and erosion control during the construction phase shall be cleaned out and converted to its approved design state.

(8) MAINTENANCE ACCESS. Every SCM installed pursuant to this Section shall be made accessible for maintenance and repair. Maintenance accesses shall:

- (a) have a minimum width of ten feet;
- (b) not include lateral or incline slopes that exceed 3:1 (horizontal to vertical); and
- (c) extend to the nearest public right-of-way.

(9) EASEMENTS. All SCMs and associated maintenance accesses on privately owned land except for those located on single family residential lots shall be located in permanent recorded easements. The SCM shall be shown and labeled within the easement. These easements shall be granted in favor of the party responsible for enforcing the stormwater program under which the SCMs were approved.

(10) SINGLE FAMILY RESIDENTIAL LOTS. Plats for residential lots that contain an SCM shall include:

- (a) the specific location of the SCM on the lot;
- (b) a typical detail for SCM to be used; and
- (c) a note that the SCM on the property has been required to meet stormwater regulations and that the property owner may be subject to enforcement actions if the SCM is removed, relocated, or altered without prior approval.

(11) OPERATION AND MAINTENANCE AGREEMENT. The owner of the SCMs shall enter into a binding Operation and Maintenance (O&M) Agreement with the party responsible for implementing the stormwater program under which the SCMs were approved. The O&M Agreement shall require the owner to maintain, repair, or reconstruct the SCMs in

accordance with the approved design plans and the O&M Plan. The O&M Agreement shall be referenced on the final plat and shall be recorded with the county Register of Deeds upon final plat approval. If no subdivision plat is recorded for the site, then the O&M Agreement shall be recorded with the county Register of Deeds so as to appear in the chain of title of all subsequent purchasers.

(12) OPERATION AND MAINTENANCE PLAN. There shall be an O&M Plan for every project subject to this Section. Rule. The O&M Plan shall specify all operation and maintenance work necessary for the function of all SCM components, including the stormwater conveyance system, perimeter of the device, inlet(s), pretreatment measures, main treatment area, outlet, vegetation, and discharge point. The O&M plan shall specify methods to be used to maintain or restore the SCMs to design specifications in the event of failure. O&M plans shall be signed by the owner and notarized. The owner shall keep maintenance records and these shall be available upon request by the party responsible for enforcing the stormwater program under which the SCMs were approved.

(13) SCM SPECIFIC MINIMUM DESIGN CRITERIA (MDC). Every SCM shall follow the applicable device specific MDC pursuant to Rules .1051 through .1062 of this Section.

(14) LICENSED PROFESSIONAL. SCMs shall be designed by an individual who meets the North Carolina licensing requirements for the type of system proposed.

(15) NEW STORMWATER TECHNOLOGIES. Applicants shall have the option to request Division approval of new stormwater technologies and associated MDC. Division approval shall be based on engineering calculations and research studies demonstrating that the new technology functions in perpetuity and is equally or more protective of water quality than the requirements of this Section.

MDC FOR INFILTRATION SYSTEMS

(1) SOIL INVESTIGATION. A site-specific soil investigation shall be performed by a licensed professional to establish the hydraulic properties and characteristics of the soil within the proposed footprint and at the proposed elevation of the infiltration system.

(2) SEPARATION FROM THE SHWT. The lowest point of the infiltration system shall be a minimum of two feet above the SHWT. However, the separation may be reduced to no less than one foot if the applicant provides a hydrogeologic evaluation prepared by a licensed professional that demonstrates that the water table will subside to its pre-storm elevation within five days or less.

(3) SOIL SUBGRADE SURFACE. The surface of the soil subgrade shall have a slope of less than or equal to two percent. Terraces and baffles may be installed to achieve a level subgrade.

(4) PRETREATMENT. Pretreatment devices shall be provided to prevent clogging. Pretreatment devices may include measures such as sumps in catch basins, gravel verges, screens on roof and patio drains, filters, filter strips, grassed swales, and forebays. Rooftop runoff that is discharged to the surface of an infiltration system shall not require pretreatment.

(5) DRAW DOWN TIME. Infiltration systems shall be designed to dewater the design volume to the bottom of the infiltration device within 72 hours or less. In-situ soils may be removed and replaced with infiltration media or infiltration media may be placed on top of in-situ soils if the applicant provides a soils report prepared by a licensed professional that demonstrates that the modified soil profile allows for infiltration of the design volume within 72 hours or less.

(6) OBSERVATION PORT. For infiltration devices located under the ground surface, a minimum of one inspection port shall be provided.

MDC FOR BIORETENTION CELLS

(1) SEPARATION FROM THE SHWT. The lowest point of the bioretention cell shall be a minimum of two feet above the SHWT. However, the separation may be reduced to no less than one foot if the applicant provides a hydrogeologic evaluation prepared by a licensed professional.

(2) MAXIMUM PONDING DEPTH FOR DESIGN VOLUME. The maximum ponding depth for the design volume shall be 12 inches above the planting surface.

(3) PEAK ATTENUATION VOLUME. Bioretention cells may store peak attenuation volume at a depth of up to 24 inches above the planting surface. The peak attenuation outlet shall be a maximum of 18 inches above the planting surface.

(4) UNDERDRAIN. An underdrain with internal water storage shall be installed unless a licensed professional demonstrates that the in-situ soil infiltration rate is two inches per hour or greater immediately prior to the initial placement of the media. The top of the internal water storage zone shall be set at a minimum of 18 inches below the planting surface.

(5) MEDIA DEPTH. The minimum depth of the media depends on the design of the cell as follows:
- (a) all cells with trees and shrubs: 36 inches;
- (b) cells without trees and shrubs:
  - (i) with no internal water storage: 24 inches; or
  - (iii) with internal water storage: 30 inches.

(6) MEDIA MIX. The media shall be a homogeneous soil mix engineered media blend with approximate volumes of:
- (a) 75 to 85 percent medium to coarse washed sand (ASTM C33, AASHTO M 6/M 80, ASTM C330, AASHTO M195, or the equivalent);
- (b) 8 to 10 percent fines (silt and clay), clay); and
- (c) 5 to 10 percent organic matter (such as pine bark fines).

(7) MEDIA P-INDEX. The phosphorus index (P-index) for the media shall not exceed 30 in NSW waters as defined in 15A NCAC 02B .0202 and shall not exceed 50 elsewhere.

(8) NO MECHANICAL COMPACTION. The media shall not be mechanically compacted. It is recommended to either water it or walk on it as it is placed.

(9) MAINTENANCE OF MEDIA. The bioretention cell shall be maintained in a manner that results in a drawdown of at least one inch per hour at the planting surface.

(10) PLANTING PLAN. For bioretention cells with vegetation other than sod, the planting plan shall be designed to achieve a minimum of 75 percent plant coverage at five years after planting. The maximum coverage with tree or shrub canopy shall be 50 percent at five years after planting. If sod is used, then it shall be a non-clumping, deep-rooted species.

(11) MULCH. For bioretention cells with vegetation other than sod, triple shredded hardwood mulch shall be used for the portion of the cell that will be inundated. Mulch shall be uniformly placed two to four inches deep.

(12) CLEAN-OUT PIPES. A minimum of one clean-out pipe shall be provided on each underdrain line. Clean out pipes shall be capped.

MDC FOR WET PONDS

(1) MAIN POOL SURFACE AREA AND VOLUME. The main pool of the wet pond shall be sized using either:
   (a) the Hydraulic Retention Time (HRT) Method; or
   (b) the SA/DA and Average Depth Method.

(2) MAIN POOL DEPTH. The average depth of the main pool shall be three to eight feet below the permanent pool elevation. The applicant shall have the option of excluding the submerged portion of the vegetated shelf from the calculation of average depth.

(3) SEDIMENT STORAGE. The forebay and main pool shall have a minimum sediment storage depth of six inches.

(4) LOCATION OF INLET(S) AND OUTLET. The inlet(s) and outlet shall be located in a manner that avoids short circuiting.

(5) FOREBAY. A forebay that meets the following specifications shall be included;
   (a) Forebay volume shall be 15 to 20 percent of the volume in the main pool;
   (b) The forebay entrance shall be deeper than the forebay exit;
   (c) The water flowing over or through the structure that separates the forebay from the main pool shall flow at a nonerosive velocity; and
   (d) If sediment accumulates in the forebay in a manner that reduces its depth to 30 inches, less than 75 percent of its design depth, then the forebay shall be cleaned out and returned to its design state.

(6) VEGETATED SHELF. The main pool shall be equipped with a vegetative shelf around its perimeter. The minimum width of the vegetated shelf shall be six feet and the slope shall be no steeper than 6:1 (horizontal to vertical).

(7) DRAWDOWN TIME. The design volume shall draw down to the permanent pool level between two and five days.

(8) PROTECTION OF THE RECEIVING STREAM. The wet pond shall discharge the runoff from the one-year, 24-hour storm in a manner that minimizes hydrologic impacts to the receiving channel.

(9) FOUNTAINS. If fountains are proposed, then a licensed professional shall provide documentation that they will not cause a resuspension of sediment within the pond, or cause erosion on the side slopes of the pond.

(10) TRASH RACK. A trash rack or other device shall be provided to prevent large debris from entering the outlet system.

(11) VEGETATION. The following criteria apply to vegetation in and around the wet pond:
   (a) The dam structure, including front and back embankment slopes,of the pond shall be vegetated with non-clumping turf grass; trees and woody shrubs shall not be allowed; and
   (b) The vegetated shelf shall be vegetated with a minimum of three diverse species of herbaceous, native vegetation, and a minimum of 50 plants per 200 square feet of shelf area shall be planted.

MDC FOR STORMWATER WETLANDS

(1) TEMPORARY PONDING DEPTH. The ponding depth for the design volume shall be a maximum of 15 inches above the permanent pool.

(2) PEAK ATTENUATION DEPTH. The wetland may be designed to temporarily pond peak attenuation volume at a depth exceeding 15 inches.

(3) SURFACE AREA. The surface area shall be sufficient to limit the ponding depth to 15 inches or less. The surface area specifications in Items (6) through (9) of this Rule are based on the wetland at its temporary ponding depth.

(4) SOIL AMENDMENTS. The pH, compaction, and other attributes of the first 12-inch depth of the soil shall be adjusted if necessary to promote plant establishment and growth.

(5) LOCATION OF INLET(S) AND OUTLET. The inlet(s) and outlet shall be located in a manner that avoids short circuiting.

(6) FOREBAY. A forebay shall be provided at the inlet to the stormwater wetland. The forebay shall comprise 10 to 15 percent of the wetland surface area. The forebay depth shall be 24 to 40 inches below the permanent pool elevation. The forebay entrance shall be deeper than the forebay exit. If sediment accumulates in the forebay in a manner that reduces its depth to 15 inches, then the forebay shall be cleaned out and returned to its design state.

(7) NON-FOREBAY DEEP POOLS. Deep pools shall be provided throughout the wetland and adjacent to the outlet structure to prevent clogging. The non-forebay deep pools shall comprise 5 to 15 percent of the wetland surface area and shall be designed to retain water between storm events. The deep pools at their deepest points shall be at least 18 inches below the permanent pool elevation.

(8) SHALLOW WATER ZONE. The shallow water zone shall comprise 35 to 45 percent of the wetland surface area. The shallow water zone shall be zero to nine inches below the permanent pool elevation.

(9) TEMPORARY INUNDATION ZONE. The temporary inundation zone shall comprise 30 to 45 percent of the wetland surface area. The temporary inundation zone shall be between 0 and 15 inches above the permanent pool elevation.

(10) DRAWDOWN TIME. The treatment volume shall draw down to the permanent pool level between two and five days.

(11) PROTECTION OF THE RECEIVING STREAM. The wetland shall discharge the runoff from the one-year, 24-hour storm in a manner that minimizes hydrologic impacts to the receiving channel.

(12) LANDSCAPING PLAN. A landscape plan prepared by a licensed professional shall be provided and shall include the following:

- (a) delineation of planting zones;
- (b) plant layout with species names and locations; and
- (c) total number and sizes of all plant species.

(13) SHALLOW WATER PLANTINGS. The shallow water zone shall be planted at a minimum density of 50 herbaceous plants per 200 square feet (equivalent to 2 foot on center spacing).

(14) TEMPORARY INUNDATION ZONE PLANTINGS. The temporary inundation zone shall be planted according to one of the following options:

- (a) 50 herbaceous plants per 200 square feet (equivalent to 2 foot on center spacing);

(b) eight shrubs per 200 square feet (equivalent to 5 foot on center spacing); or
(c) one tree and 40 grass-like herbaceous plants per 100 square feet.

(15) DAM STRUCTURE AND PERIMETER FILL SLOPES. On the dam structure and perimeter fill slopes, non-clumping turf grass shall be provided, and trees and woody shrubs shall not be allowed.

(16) NO CATTAILS. Cattails shall not be planted in the wetland.

(17) TRASH RACK. A trash rack or other device to trap debris shall be provided on piped outlet structures.

MDC FOR PERMEABLE PAVEMENT

(1) SOIL INVESTIGATION. For infiltrating pavement systems, site-specific soil investigation shall be performed by a licensed professional to establish the hydraulic properties and characteristics within the proposed footprint and at the proposed elevation of the permeable pavement system.

(2) SHWT REQUIREMENTS. The minimum separation between the lowest point of the subgrade surface and the SHWT shall be:
(a) two feet for infiltrating pavement systems; however, the separation can be reduced to a minimum of one foot if the applicant provides a soils report prepared by a licensed professional that demonstrates that the modified soil profile allows for infiltration of the design volume within 72 hours; and
(b) one foot for detention pavement systems.

(3) SITING. Permeable pavement shall not be installed in areas where toxic pollutants are stored or handled.

(4) SOIL SUBGRADE SLOPE. The soil subgrade surface shall have a slope of less than or equal to two percent.

(5) STONE BASE. Washed aggregate base materials shall be used.

(6) PAVEMENT SURFACE. The proposed pavement surface shall have a demonstrated infiltration rate of at least 50 inches per hour using a head less than or equal to 4 inches.

(7) RUNOFF FROM ADJACENT AREAS. Runoff to the permeable pavement from adjacent areas shall meet these requirements:
(a) The maximum ratio of additional built-upon area that may drain to permeable pavement is 1:1. Screened rooftop runoff shall not be subject to the 1:1 loading limitation.
(b) Runoff from adjacent pervious areas shall be prevented from reaching the permeable pavement except for incidental, unavoidable runoff from stable vegetated areas.

(8) DRAW DOWN TIME. Infiltrating permeable pavement systems shall be designed to dewater the design volume to the bottom of the subgrade surface within 72 hours. In-situ soils may be removed and replaced with infiltration media or infiltration media may be placed on top of in-situ soils if the applicant provides a soils report prepared by a licensed professional that demonstrates that the modified soil profile allows for infiltration of the design volume within 72 hours.

(9) OBSERVATION WELL. Permeable pavement shall be equipped with a minimum of one observation well placed at the low point in the system. If the subgrade is terraced, then there shall be one observation well for each terrace. Observation wells shall be capped.

(10) DETENTION SYSTEMS. Pavement systems may be designed to detain stormwater in the

aggregate for a period of two to five days.

(11) EDGE RESTRAINTS. Edge restraints shall be provided around the perimeter of permeable interlocking concrete pavers (PICP) and grid pavers.

(12) GRADE WHEN DRY. The soil subgrade for infiltrating permeable pavement shall be graded when there is no precipitation.

(13) INSPECTIONS AND CERTIFICATION. After installation, permeable pavement shall be protected from sediment deposition until the site is completed and stabilized. An in-situ infiltration permeability test shall be conducted and certified by a licensed professional on the pavement after site stabilization.

MDC FOR SAND FILTERS

(1) SHWT SEPARATION. The minimum separation between the lowest point of the sand filter system and the SHWT shall be:
   (a) two feet for open-bottom designs; and
   (b) one foot for closed bottom designs. Exceptions to the one foot SHWT separation may be made if a licensed professional provides documentation that the design will neither float nor drain the water table.

(2) TWO CHAMBER SYSTEM. The sand filter shall include a sediment chamber and a sand chamber. It is recommended to provide equivalent storage volume in each chamber.

(3) SEDIMENT/SAND CHAMBER SIZING. The volume of water that can be stored in the sediment chamber and the sand chamber above the sand surface combined shall be 0.75 times the treatment volume. The elevation of bypass devices shall be set above the ponding depth associated with this volume. The bypass device may be designed to attenuate peak flows.

(4) MAXIMUM PONDING DEPTH. The maximum ponding depth from the top of the sand to the bypass device shall be six feet.

(5) FLOW DISTRIBUTION. Incoming stormwater shall be evenly distributed over the surface of the sand chamber.

(6) SAND MEDIA SPECIFICATION. Sand media shall meet ASTM C33 or the equivalent.

(7) MEDIA DEPTH. The filter bed shall have a minimum depth of 18 inches. The minimum depth of sand above the underdrain pipe shall be 12 inches.

(8) MAINTENANCE OF MEDIA. The sand filter shall be maintained in a manner that results in a drawdown of at least two inches per hour at the sand surface.

(9) CLEAN-OUT PIPES. At least one clean-out pipe shall be provided at the low point of each underdrain line. Clean out pipes shall be capped.

MDC FOR RAINWATER HARVESTING

(1) MAJOR COMPONENTS OF A RAINWATER HARVESTING SYSTEM. Rainwater harvesting systems shall include the following components:
   (a) a collection system;
   (b) a pre-treatment device to minimize gross and coarse solids collection in the tank;
   (c) a cistern or other storage device;
   (d) an overflow; and
   (e) a distribution system.

(2) FATE OF CAPTURED WATER. Captured stormwater shall be used or discharged as follows:
   (a) use to meet a water demand. The usage, type, volume, frequency, and seasonality of water demand shall be established and justified;
   (b) discharge via a passive drawdown device to a vegetated infiltration area or another SCM; or
   (c) a combination of use and passive discharge.

(3) SIZING. A rainwater harvesting system shall be considered as a primary SCM if the system is sized and water demand, passive discharge or a combination of the two is provided for 86% of the total annual runoff volume as demonstrated through water balance calculations.

(4) WATER BALANCE CALCULATIONS. The water balance shall be calculated using the NCSU Rainwater Harvester model or another continuous-simulation hydrologic model that calculates the water balance on a daily or more frequent time-step using a minimum of five representative years of actual rainfall records. The model shall account for withdrawals from the cistern for use, active or passive drawdown, and additions to the cistern by rainfall, runoff and a make-up water source if applicable.

(5) DISTRIBUTION SYSTEM. The distribution system shall be tested for functionality prior to the completion of the rainwater harvesting system. The design shall include a protocol for testing the functionality of the distribution system upon completion of the initial system and upon additions to the existing system.

(6) SIGNAGE REQUIREMENTS. All harvested rainwater outlets such as spigots and hose bibs, and appurtenances shall be labeled as “Non-Potable Water” to warn the public and others that the water is not intended for drinking. Passive drawdown devices, when employed, shall be marked with identifying signage or labels that are visible to owners and maintenance personnel.

MDC FOR GREEN ROOFS

(1) MEDIA SPECIFICATION. The maximum organic fraction of the media shall be ten percent by volume.

(2) DESIGN VOLUME. The design volume for a green roof shall equal the media depth times the plant available water (PAW). The maximum rainfall depth that may be treated by a green roof is 1.5 inches.

(3) MINIMUM MEDIA DEPTH. The minimum media depth shall be four inches if the roof will not be irrigated or three inches if the roof will be irrigated. For roofs with three-inch media depths, an irrigation plan shall be included in the Operation and Maintenance Plan.

(4) VEGETATION SPECIFICATION. The planting plan shall be designed to achieve a 75 percent vegetative cover within two years.

(5) SLOPE. The green roof shall have a slope (or pitch) of no greater than eight percent, unless a container system designed for a greater slope is used.

MDC FOR LEVEL SPREADER-FILTER STRIPS

(1) LEVEL SPREADER LENGTH. The level spreader shall be a minimum of 10 feet in length per one cubic foot per second of stormwater flow that is directed to it.

(2) REQUIRED STORM INTENSITY AND BYPASS. The required storm intensity and bypass system shall be based on the source of the stormwater:

(a) A level spreader that receives flow directly from the drainage area shall be sized based on the flow rate during the 0.75 inch per hour storm, with a flow bypass system for larger storm events; or

(b) A level spreader that receives flow from an SCM shall be sized based on the draw down rate of the design volume, with a flow bypass for larger storm events.

(3) EXCEPTION FROM FLOW BYPASS REQUIREMENT. A flow bypass system is not needed if the level spreader is sized to handle the flow during 10-year storm event.

(4) BLIND SWALE. Immediately upslope of the level spreader, there shall be a blind swale or other method of ponding water. The blind swale shall be designed to provide for uniform overtopping of the level spreader.

(5) LEVEL SPREADER SPECIFICATIONS. The lip of the level spreader shall be at a uniform elevation with a construction tolerance of plus or minus 0.25 inch at any point along its length. The level spreader shall be constructed of concrete or other stable material.

(6) LEVEL SPREADER SHAPE. The level spreader shall be straight or convex in plan view.

(7) TRANSITION ZONE. Immediately downslope of the level spreader, there shall be a one to three inch drop followed by a transition zone that is protected from erosion via aggregate or high performance turf reinforcement matting. The transition zone shall be a minimum of 12 inches wide.

(8) MINIMUM WIDTH OF THE FILTER STRIP. The minimum width of the filter strip shall be 30 feet, measured perpendicular to the level spreader lip.

(9) NO DRAWS OR CHANNELS IN THE FILTER STRIP. The filter strip shall not contain draws or channels.

(10) FILTER STRIP SPECIFICATIONS. The following specifications shall apply to the filter strip:

(a) Filter strips shall be graded with a uniform transverse slope of eight percent or less;

(b) The pH, compaction, and other attributes of the first 12 inches of the soil shall be adjusted if necessary to promote plant establishment and growth;

(c) The filter strip and side slopes shall be planted with non-clumping, deep-rooted grass sod; and

(d) Soils shall be stabilized with temporary means such as straw or matting until the permanent vegetative cover has taken root or the runoff shall be directed elsewhere until vegetation has established.

MDC FOR DISCONNECTED IMPERVIOUS SURFACES

(1) VEGETATED RECEIVING AREA FOR DISCONNECTED ROOFS. The following requirements shall apply to vegetated receiving areas for disconnected roofs:

(a) A maximum of 500 square feet of roof shall drain to each disconnected downspout;

(b) The receiving vegetated area shall be a rectangular shape. The length of the rectangle in the direction of flow shall be a minimum of 0.04 times the area of the roof that drains to it. The width of the rectangle shall be one-half the length of the rectangle.

(c) The downspout shall discharge in the center of upslope end of the vegetated receiving area;

(d) The downspout shall be equipped with a splash pad; and

(e) The vegetated receiving area shall not include any built-upon area.

(2) VEGETATED RECEVING AREA FOR DISCONNECTED PAVEMENT. The following requirements shall apply to the vegetated receiving area for disconnected pavement:

(a) The pavement draining to the vegetated receiving area shall be a maximum of 100 feet in length in the direction of flow;

(b) The vegetated receiving area shall be a minimum of 10 feet in length in the direction of flow; and

(c) The vegetated receiving area shall not contain any built-upon area except for incidental areas such as utility boxes, signs and lamp posts.

(3) VEGETATED RECEIVING AREA SPECIFICATIONS. The following specifications shall apply to the vegetated receiving areas for both disconnected roofs and disconnected pavement:

(a) Vegetated receiving areas shall have a uniform transverse slope of 8 percent or less, except in Hydrologic Soil Group A soils where slope shall be 15 percent or less;

(b) The pH, compaction, and other attributes of the first eight inches of the soil shall be adjusted if necessary to promote plant establishment and growth;

(c) The vegetated receiving area shall be planted with a non-clumping, deep-rooted grass species; and

(d) Soils shall be stabilized with temporary means such as straw or matting until the permanent vegetative cover has taken root or the runoff shall be directed elsewhere until vegetation has established.

MDC FOR TREATMENT SWALES

(1) SHWT. Swales shall not be excavated below the SHWT.

(2) SHAPE. Swales shall be trapezoidal in cross-section with a maximum bottom width of six feet. Side slopes stabilized with vegetative cover shall be no steeper than 3:1 (horizontal to vertical). Steeper vegetated slopes may be considered on a case-by-case basis provided that it is demonstrated that the soils and vegetation will remain stable in perpetuity.

(3) SWALE SLOPE AND LENGTH. The longitudinal swale slope shall not exceed seven percent. The swale slope and length shall be designed to achieve a flow depth of six inches or less during the 0.75 inch per hour storm and a minimum hydraulic retention time of four minutes.

(4) GRASS SPECIFICATION. The grass species in the swale shall be:
- (a) non-clumping and deep-rooted;
- (b) able to withstand a velocity of four feet per second;
- (c) managed at an average of six inches; and
- (d) not be cut lower than four inches.

(5) CONVEYANCE OF LARGER STORMS. Swales shall be designed to non-erosively pass the ten-year storm.

MDC FOR DRY PONDS

(1) SEPARATION FROM THE SHWT. The lowest point of the dry pond shall be a minimum of six inches above the SHWT.

(2) TEMPORARY POOL DEPTH. The maximum depth of the temporary pool shall be 10 feet.

(3) UNIFORM GRADING AND POSITIVE DRAINAGE. The bottom of the dry pond shall be graded uniformly to flow toward the outlet structure without low or high spots other than an optional low flow channel.

(4) LOCATION OF INLET(S) AND OUTLET. The inlet(s) and outlet shall be located in a manner that avoids short circuiting.

(5) PRETREATMENT. Pretreatment devices shall be provided to settle sediment and prevent erosion. Pretreatment devices may include measures such as gravel verges, filter strips, grassed swales, and forebays.

(6) DRAWDOWN TIME. The design volume shall draw down between two and five days.

(7) PROTECTION OF THE RECEIVING STREAM. The dry pond shall discharge the runoff from the one-year, 24-hour storm in a manner that minimizes hydrologic impacts to the receiving channel.

(8) OUTLET. The dry pond shall include a small permanent pool near the outlet orifice to reduce clogging and keep floating debris away from the orifice. A screen or other device shall be provided to prevent large debris from entering the outlet system.

(9) VEGETATION. The dam structure, including the front and back embankment slopes, shall be planted with non-clumping turf grass, and trees and woody shrubs shall not be allowed.